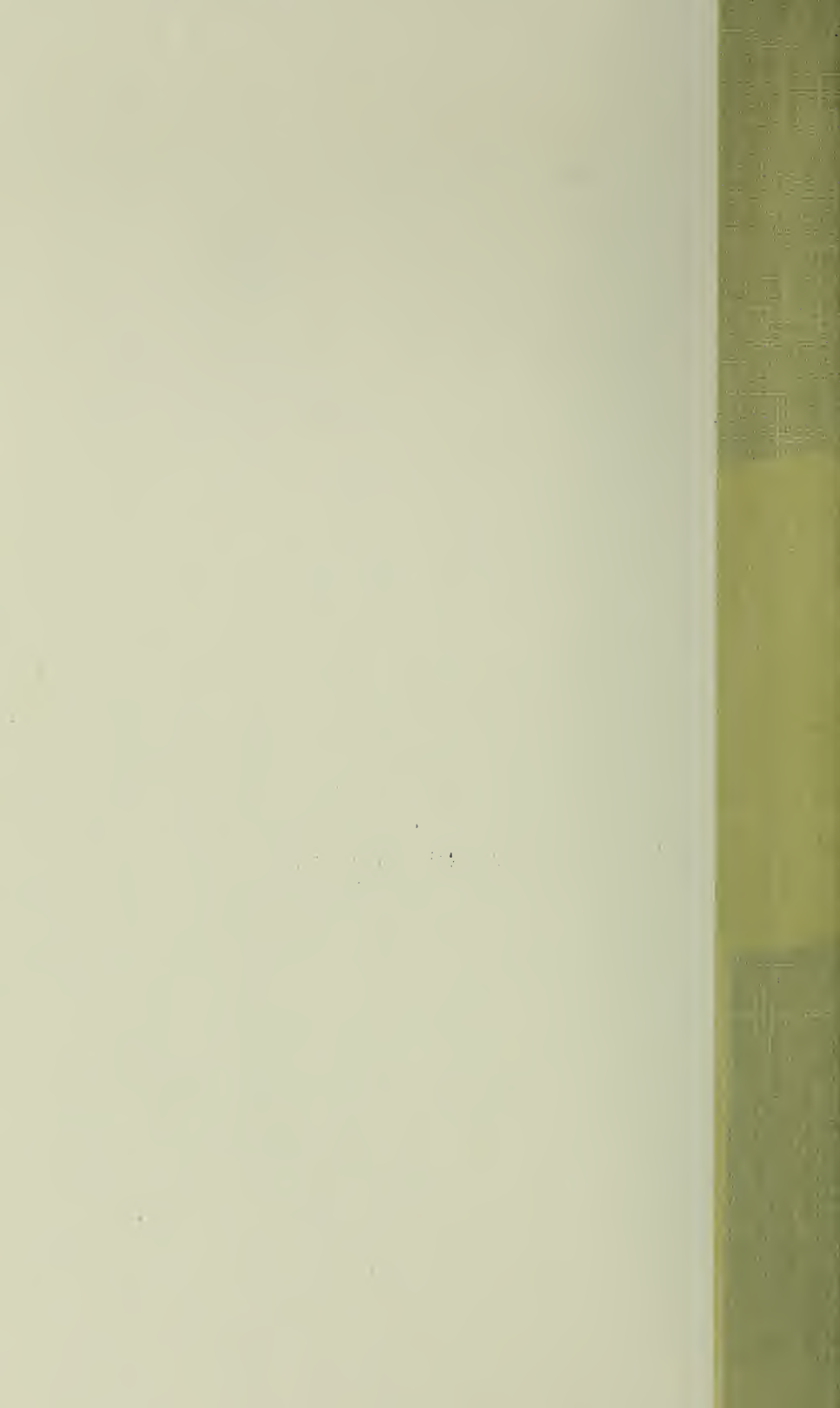


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STATION.

How to Fight

CRANBERRY INSECTS

BY

HENRY J. FRANKLIN

This bulletin is a revision of Bulletin No. 115 of this Station, and gives the results of the studies made on cranberry insects since that bulletin was published. It contains directions for the treatment of different cranberry insects.

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DEPARTMENT OF ENTOMOLOGY.

How to Fight Cranberry Insects.

BY HENRY J. FRANKLIN, PH. D.

This bulletin is a revision of bulletin No. 115 of this Station and is intended to bring the economic side of that report up to the end of the year 1907 when the writer's connection with the work ceased, thus giving the results of two full years' study and experiments on these insects. Prof. C. H. Fernald and Dr. H. T. Fernald have assisted the author by suggestions and advice during the investigation and by revising the manuscript of this bulletin.

THE CRANBERRY FRUIT WORM.

Mineola vaccinii (Riley).

Recommendations for treatment:

A. On bogs which have water supply for winter flowage and for reflowage:

1. *Reflow immediately after picking, for ten days or two weeks. Draw off this flowage and, after allowing the foliage to ripen, put on the water for the winter.* If, in a series of closely connected bogs, some bearing early varieties only, are so situated that they may be flowed independently of the others, reflow them as soon as the fruit is off, without waiting to finish picking the other bogs.

2. *Draw off the winter flowage early in April as a rule but every third or fourth year hold it until after the middle of May.*

B. On winter flowed bogs which have not water supply for reflowage:

1. *Put on the winter flowage as soon as possible after the cranberry foliage has ripened and hardened.*

2. *Hold this flowage every spring until early in April, and every third or fourth year until after the middle of May.*

In Bulletin No. 115 it was recommended to hold this flowage until the 20th of April each year, the idea being to let this flowage protect the buds from early frosts and at the same time destroy the wintering fruit worms to some degree. It seems preferable however, to let the water off earlier and allow the vines to harden as much as possible before the later frosts come in May and the first part of June.

C. On bogs which are dry or have very scanty winter flowage :

No practicable remedy has thus far been discovered for the fruit worm on bogs of this kind, and we can only suggest that further experiments with arsenical poisons be made. In our experience, a combined Bordeaux mixture and arsenate of lead spray (the latter being used at the rate of five or six pounds to 50 gallons of water), with about five pounds of resin fish oil soap (per 50 gallons of water) added as an adhesive, has given the best results. This spray, however, often shows a strong tendency to cling to the fruit at picking time and is therefore objectionable. The fact that it is necessary to spray two or three times each season in order to get anything like satisfactory results against the fruit worms also makes this method of treatment objectionable because so much spraying necessitates no small amount of injury to the vines and the fruit. Where ants's nests are present they should not be disturbed as some of the common species of ants found on dry bogs destroy not only fruit worms but also certain other injurious insects, notably the Yellow-headed Cranberry Worm.

D. For all bogs :

1. *Bury the "screenings," to destroy any worms which may be in them.*
2. *Clean out all cracks and crevices where worms may have spun up in the screen house—if this is near the bog—to guard against possible infestation from this source.*

More experiments with fall flowage may show that either a more prolonged reflow immediately after picking or an earlier putting on of the winter flowage will be entirely efficient and satisfactory as treatments for this insect when the water supply is sufficient. It is also possible that good results might be obtained on many bogs by increasing the number of catchwaters in the main ditch and running small dikes (boards laid down edgewise and end to end would per-

haps be the easiest to build) across the bog from these catchwaters, dividing it into small areas of nearly equal elevation, and thus allowing the water to be held up among the vines without covering them. These dikes need not be built at right angles to the main ditch, but could be placed at angles to suit the general "lay" of the surface of the bog. By this arrangement, the benefits of an annual late holding of winter flowage could be obtained without the attendant injury. This method should get rid of the fruit worm almost entirely, and in many cases, would also be of great value by preventing injury from frost. In case of necessity, this method of flooding the bog could also probably be made use of in fighting the fire worm (see discussion under Fire Worm.)

THE FIRE WORM.

Eudemis vacciniana (Pack.)

This insect is rarely if ever troublesome in Massachusetts on strictly dry bogs. Those which have water supply for quick and repeated reflowage can also be easily kept free from this pest if the water be properly handled, and such bogs are seldom infested to any extent. Those bogs, many of them very large, which are winter flowed and have at most a rather scanty reflowage are the ones often found seriously infested, and the infestation is usually most serious where the winter flowage is deepest.

Parasites and winter killing of the eggs of this insect are apparently the chief factors working against this pest on dry bogs, the former probably being by far the more effective of the two. Winter flowage will destroy the parasites present when the water is put on, but this treatment, instead of also destroying the fire worm eggs, seems to protect them against the severity of the winter. These facts lead us to make the following

Recommendations and suggestions for treatment :

A. With Water:—

1. *Where bogs may be so treated it is advisable to divide them into smaller areas by dikes, thus permitting the late holding of the winter flowage on the higher sections, so that the lower sections can be quickly reflowed at any time up to the end of the first week in June. With a bog thus divided, all the sections could be covered with much less water than would be needed to cover the bog as a whole without*

the dikes, and for this reason, in many cases, the mere dividing of the bog would be sufficient to provide for the quick reflowage of the various sections without a late holding of the winter flowage on the higher ones. On bogs where it would be necessary to hold this flowage it would be best to alternate the sections on which the water is held late, from year to year, as annual late holding reduces the crop. With a bog so arranged that the infested portion could be quickly reflowed at any time it would be best to plan to reflow once for about fifty hours during the last week in May, and again for about twenty-four hours as late in June before blossoming as possible without running any serious risk of injuring the buds. Perhaps the tenth of June would be about the right average date.

It should be noted here that dividing large bogs as has just been recommended, would also make it possible to protect them from frost much more effectively and surely.

It is probable that many bogs could be treated satisfactorily as follows:

2. *Divide that portion of the bog surface which includes the infested portion into areas of nearly equal elevation by means of catchwaters in the main ditch and low dikes running out on each side from these, as already described for the fruit worm. With the bogs so arranged, wait, in the case of either or both broods of the fire worm, until the worms have reached the stage of general pupation on the surface of the bog under the vines, then raise the water up among the vines without covering them and hold it there for three days. When full grown the worms go from the vines to the ground where they pupate, becoming quiet. Later they escape from these pupæ as moths.*

The first period during which the fire worms hatch from the eggs is often quite a long one, young worms sometimes hatching continuously for five weeks time. Consequently, the period during which the worms become full grown is also often quite a long one, and may last three or four weeks, during which time one worm after another will leave for the ground to pupate.

When this is the case, the treatment given above may be repeated (at least with the first brood) at intervals of a week. The dikes and catchwaters used for this treatment may also be used for fighting the fruit worm and frosts as already pointed out.

3. If a bog be treated to destroy fire worms as above suggested, the worms will have a chance to do some injury before the water is

used. To prevent this, spray with Arsenate of lead, using six or seven pounds in fifty gallons of water, as soon as the eggs of either brood begin to hatch. As the time of hatching is often prolonged as already stated, it will usually be found advisable to repeat this spraying after a week or ten days for each brood.

B. Without Water:

The fact that this insect is not troublesome on dry bogs suggests the following treatment.

Sand an infested bog heavily and then let it go without winter flowage for three or four winters, thus allowing the winter weather and parasites to work against the insect. At the same time, aid these natural agents of control by spraying with Arsenate of lead as recommended under No. 3 above. Of course, anyone using this method of control will necessarily run some risk of winter killing on the bog.

THE FALSE ARMY WORM.

Calocampa nuptera Lintner.

Recommendations for treatment:

A. On bogs with abundant water supply for reflowage:

1. *Examine the bogs carefully from time to time, from May 1st to May 15th.* This may be done most conveniently by sweeping the vines with an insect net and counting the worms collected in it. In general if only four or five caterpillars are collected by fifty sweeps of an ordinary net, when tried on various parts of a bog, the infestation is only slight, and would, better, in most cases, be disregarded unless abundant water supply is available. If, however, every fifty sweeps collects fifteen to twenty or more, the trouble is likely to be serious and treatment is needed. *If caterpillars are found in sufficient abundance to make it advisable, reflow for from twenty-four to thirty-six hours as soon after May 15th as practicable. If the young caterpillars are present in abundance, this will save a great amount of injury to the buds. Furthermore, less difficulty will be experienced at this time with worms which survive the flooding and are washed ashore alive.*

2. *If caterpillars are present a few days after the first reflow, put on the water again for 24 to 36 hours.*

3. *As far as possible destroy all the worms which are washed*

ashore alive during a reflow. In case the grower is favored with weather damp enough to make it safe, this may probably be most conveniently done by spraying the margins where the worms come ashore, with kerosene and then setting it afire while the water is still on the bog. If the grower is not so favored, it is probable that the spraying alone would be fairly effectual.

B. On bogs with winter flowage and enough water supply for one good reflow :

1. *Hold the winter flowage late (until toward the 20th of May) every third or fourth year, if the bog is being regularly attacked by this pest. This treatment also holds for the fruit worm under similar bog conditions.*

2. *In other years, draw off the winter flowage early in April and do not reflow for the caterpillars until danger from frost is practically past unless they are so plentiful as to threaten serious injury. Of course, if frost so threatens, between the 15th and 25th of May, that it seems necessary to reflow on that account, the water will then destroy the worms.*

3. *If the reflow must be used before it will destroy the worms, then the only resort is arsenical poisoning as recommended below for dry bogs.*

4. *If the worms become very plentiful, it would be better, in most cases, to use the reflow about the 20th of May and run the risk of later frosts.*

5. *If the bog is not level and water for only a partial reflow is to be had, this water may be used as in 1, 2 and 3 for the portions of the bog which can be covered, and the remainder may be treated as recommended for dry bogs.*

C. On bogs with winter flowage only :

1. *Hold the winter flowage until after the middle of May every third or fourth year. This is also recommended for the fruit worm.*

2. *In other years, treat as for dry bogs.*

D. On dry bogs :

1. *If the young worms are found to be hatching plentifully, spray at once (about the 8th of May) with arsenate of lead used at the rate of seven pounds to fifty gallons of water.*

2. These caterpillars show a strong tendency to work at night and hide under the vines or anything else that they can find during the day. *On this account, in case the caterpillars have become so far developed that it is not practicable to spray*, lay down boards for them to hide under and destroy those that collect there.

THE YELLOWHEAD CRANBERRY WORM.

Peronea minuta (Robinson).

In Massachusetts this insect is troublesome only on dry bogs. It works very much as does the true fire worm on winter flowed bogs. It is very heavily parasitized each year and the parasites need only a little assistance to keep it entirely under control. One thorough spraying with Arsenate of lead at the rate of five pounds in fifty gallons of water at the time of the hatching of the eggs of the second brood of worms (there are two broods in Massachusetts, the first seldom doing much injury) is sufficient to clear a badly infested bog for three or four years. The time for this spraying will vary somewhat with the season, but will average from the 4th to the 10th of July.

THE CRANBERRY GIRDLER.

Crambus hortuellus (Hübner).

Recommendations for treatment :

A. On bogs which can be reflowed :

1. *Reflow immediately after picking, for a week or ten days.*
2. *If the early fall flowing has been neglected, reflow for a day or two about the 10th of June.*

B. On dry bogs :

This insect is rarely, if ever, seriously injurious where the vines have been freshly sanded, while it is worst on those bogs on which a thick accumulation of old leaves has been allowed to collect under the vines. It seems probable therefore, that if a dry bog were kept well sanded, each year's production of old leaves thus being covered up, there would be no trouble from this insect. Frequent sanding is also helpful in throwing off frosts on bogs without water supply.

1. *It is therefore recommended as a preventive of both frost and girdler injury, to sand all dry bogs during the first two weeks in May*

every year. It may also be possible that bogs already infested could be cleared of this insect by sanding, but this remains to be proved. It is certain that sanding helps the vines to recover quickly from attacks of the girdler.

2. *Burn the vines on a badly infested area* with a gasoline torch, at a time when the vines will not otherwise burn readily, so as to guard against setting a fire which might escape from control. This burning should be done early in the season before the growth starts. After burning reset the burned area.

HINTS ON SPRAYING AND ON THE USE OF WATER.

Where water is available for the purpose, it is a good plan to reflow a bog for a day in June, as late before the time of blossoming as possible without causing injury. Such a reflow clears a bog of a large number of injurious insects which, though they may not be so abundant as to attract attention, are still a continuous drain on the vines by eating their leaves and sucking their juices. This reflow by destroying many such insects, gives the vines a better chance during the summer.

In spraying, the following points should be given particular attention :

1. Spray for a purpose. Do not spray "on general principles" only, but when there is good reason to believe the bog really needs it.

2. Be careful to spray rather than sprinkle. For good work it is essential to use a nozzle giving a fine, misty spray. In the experience of the writer, the "Large Mistry" Nozzle has given the most satisfactory results on cranberry bogs.

3. Keep the materials well stirred up in the barrel and spray evenly and *thoroughly*.

4. Spray behind the pump instead of ahead of it and be careful not to drag the hose over freshly sprayed vines, nor to walk through them.

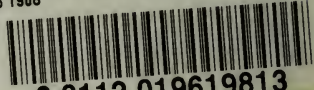
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